

**PROJECT SPECIAL PROVISIONS****ROADWAY****CLEARING AND GRUBBING – METHOD III:**

(4-6-06)

SP2 R02

Perform clearing on this project to the limits established by Method “III” shown on Standard No. 200.03 of the *Roadway Standard Drawings*.

**EXCAVATION, HAULING, AND DISPOSAL OF CONTAMINATED SOIL:**

The Contractor’s attention is directed to the possibility that soils containing low concentrations of volatile organic compounds (petroleum) may be encountered in the northeastern quadrant of the –L- and –Y8- intersection. The proposed drainage shown on plan sheet 21 is in this area.

If contaminated soils are encountered, the Contractor will be responsible for the proper excavation, hauling and disposal of same. Only that soil which is necessary to complete the work, as directed by the Engineer, is to be excavated. A report documenting the contamination at the Midway Trading Post gas station is on file with the Geotechnical Engineering Unit and a copy is available at the Contractor’s request.

The Contractor is entirely responsible for compliance with all OSHA, EPA, DOT DENR and local, state, and federal rules and regulations pertaining to excavation and transportation of the contaminated soil. Examples of such rules and regulations include, but are not limited to, 29 CFR 1910 and 1926, 40 CFR 260 – 265, 49 CFR 173 AND 178, 15A NCAC 13A North Carolina Hazardous Waste Management Rules, NCGS 130A – 310 Inactive Hazardous Sites, the Federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Federal Resource Conservation and Recovery Act (RCRA). Inclusion of this paragraph is meant to highlight the Contractor’s responsibility for regulatory compliance in all phases of work on this project.

The quantity of contaminated soil to be paid for will be the actual number of tons of soil which have been satisfactorily excavated, hauled, and disposed of as required.

The soil will be measured by being weighed in trucks on certified platform scales or other certified weighing devices, with appropriate deductions being made for excessive soil moisture where saturated soil is involved.

The quantity of contaminated soil, measured as provided herein, will be paid for at the contract unit price per ton for “Disposal of Contaminated Soil”.

**SURVEYING FOR STRUCTURE ONLY (OAK ISLAND):**

For all aspects of the structure construction for the bridge over the Intracoastal Waterway, the Contractor will be responsible for surveying, construction layout and associated calculations. Perform construction surveying and layout for the structures in accordance with Section 801 of the Standard Specifications and *The Manual for Construction Layout*.

The Department will provide a minimum of two horizontal and vertical control points on each side of the bridge. Verify this control in accordance with Section 801 of the Standard Specifications and notify the Engineer of any discrepancies with the control. If control discrepancies exist, obtain written direction for corrective action prior to utilizing such control.

Coordination with Department survey crews will be required. State Forces will perform all other surveying on this project.

Payment will be made under:

Construction Survey (ICW Structure Only).....Lump Sum

**TEMPORARY DETOURS:**

(7-1-95)

SP2 R30

Construct temporary detours required on this project in accordance with the typical sections in the plans or as directed.

Payment for the construction of the detours will be made at the contract unit prices for the various items involved. After the detours have served their purpose, remove the portions deemed unsuitable for use as a permanent part of the project as directed by the Engineer. Salvage within the right of way, as directed by the Engineer, for removal by State Forces. Pipe culverts and stockpile the aggregate base course removed from the detours at locations removed from the detours remain the property of the Contractor. Remove pipe culverts from the project when they are no longer needed. Place pavement and earth material removed from the detour in embankments or dispose of in waste areas furnished by the Contractor. Aggregate base course and earth material that is removed will be measured and will be paid for at the contract unit price per cubic yard for *Unclassified Excavation*. Pavement that is removed will be measured and will be paid for at the contract unit price per square yard for *Removal of Existing Pavement*. Pipe culverts that are removed will be measured and will be paid for at the contract unit price per linear foot for *Pipe Removal*. Such prices and payments will be full compensation for the work of removing, salvaging, and stockpiling aggregate base course; placing and removing pipe culverts; and for placing earth material and pavement in embankments or disposing of earth material and pavement in waste areas.

**SHALLOW UNDERCUT:**

(2-19-02) (Rev 7-18-06)

SP2 R35

Perform undercut excavation and place a combination of fabric for soil stabilization and Class IV Subgrade Stabilization at locations as directed. Work includes performing undercut excavation,

disposing of unsuitable material, furnishing and placing fabric for soil stabilization; and furnishing, placing and compacting Class IV Subgrade Stabilization.

**Materials**

| <b>Item</b>                     | <b>Section</b>  |
|---------------------------------|---|
| Fabric for Soil Stabilization   | 270   |
| Class IV Subgrade Stabilization | 1016-3, Class IV, or Material meeting gradation requirements of Table 520-1, Column C |

**Construction Methods**

Perform undercut excavation in accordance with Section 225 and/or Section 226.

Place fabric for soil stabilization in accordance with Section 270.

Place Class IV Subgrade Stabilization by back dumping material on previously placed fabric.

Compact material to 95% of AASHTO T-99, Method "D" density or compact material to the highest density that can be reasonably obtained.

**Measurement and Payment**

*Undercut Excavation* will be measured and paid for in accordance with Section 225 and/or Section 226 of the *Standard Specifications*.

*Fabric for Soil Stabilization* will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

*Class IV Subgrade Stabilization*, as accepted in place, will be measured and paid for by the ton in accordance with Section 106-7 of the *Standard Specifications*.

Payment will be made under:

| <b>Pay Item</b>                 | <b>Pay Unit</b> |
|---------------------------------|-----------------|
| Undercut Excavation             | Cubic Yard      |
| Fabric for Soil Stabilization   | Square Yard     |
| Class IV Subgrade Stabilization | Ton             |

**SHOULDER AND FILL SLOPE MATERIAL:**

(5-21-02)

SP2 R50

**Description**

Perform the required shoulder and slope construction for this project in accordance with the applicable requirements of Section 560 and Section 235 of the *Standard Specifications* except as follows:

Construct the top 6 inches of shoulder and fill slopes with soils capable of supporting vegetation.

Provide soil with a P.I. greater than 6 and less than 25 and with a pH ranging from 5.5 to 6.8. Remove stones and other foreign material 2 inches or larger in diameter. All soil is subject to test and acceptance or rejection by the Engineer.

Obtain material from within the project limits or approved borrow source.

### **Compensation**

When the Contractor elects to obtain material from an area located beneath a proposed fill sections which does not require excavation for any reason other than to generate acceptable shoulder and fill slope material, the work of performing the excavation will be considered incidental to the item of *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow* or *Shoulder Excavation* in the contract, this work will be considered incidental to *Unclassified Excavation*. Stockpile the excavated material in a manner to facilitate measurement by the Engineer. Fill the void created by the excavation of the shoulder and fill slope material with suitable material. Payment for material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow Excavation* or *Shoulder Borrow*, then the material will be paid for at the contract unit price for *Unclassified Excavation*. The material used to fill the void created by the excavation of the shoulder and fill slope material will be made at the contract unit price for *Unclassified Excavation*, *Borrow Excavation*, or *Shoulder Borrow*, depending on the source of the material.

Material generated from undercut excavation, unclassified excavation or clearing and grubbing operations that is placed directly on shoulders or slope areas, will not be measured separately for payment, as payment for the work requiring the excavation will be considered adequate compensation for depositing and grading the material on the shoulders or slopes.

When undercut excavation is performed at the direction of the Engineer and the material excavated is found to be suitable for use as shoulder and fill slope material, and there is no area on the project currently prepared to receive the material generated by the undercut operation, the Contractor may construct a stockpile for use as borrow at a later date. Payment for the material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*.

When shoulder material is obtained from borrow sources or from stockpiled material, payment for the work of shoulder construction will be made at the contract unit price per cubic yard for *Borrow Excavation* or *Shoulder Borrow* in accordance with the applicable provisions of Section 230 or Section 560 of the *Standard Specifications*.

**REINFORCED BRIDGE APPROACH FILL:**

(3-18-03) (Rev.7-18-06)

SP4 R01

**Description**

This work consists of all work necessary to construct reinforced bridge approach fills in accordance with these provisions and the plans, and as directed by the Engineer.

**Materials**

**Geomembrane**

Provide geomembrane that is impermeable, composed of polyethylene polymers or polyvinyl chloride, and meets the following physical requirements:

| <b>Property</b>                  | <b>Requirements</b>                           | <b>Test Method</b> |
|----------------------------------|---|--------------------|
| Thickness                        | 25 mils Minimum                               | ASTM D1593         |
| Tensile Strength at Break        | 100 lb/inch Minimum                           | ASTM D638          |
| Puncture Strength                | 40 lbs Minimum                                | ASTM D 4833        |
| Moisture Vapor Transmission Rate | 0.018 ounce/yard <sup>2</sup> per Day Maximum | ASTM E96           |

**Fabric**

Refer to Section 1056 for Type 2 Engineering Fabric and the following:

Use a woven fabric consisting of strong rot-proof synthetic fibers such as polypropylene, polyethylene, or polyester formed into a stable network such that the filaments or yarns retain their relative positions to each other.

| <b>Fabric Property</b> | <b>Requirements</b>       | <b>Test Method</b> |
|------------------------|---------------------------|--------------------|
| Minimum Flow Rate      | 2 gallons/min/square foot | ASTM D 4491        |

Lamination of fabric sheets to produce the physical requirements of a fabric layer will not be accepted. Furnish letters of certification from the manufacturer with each shipment of the fabric and geomembrane attesting that the material meets the requirements of this provision; however, the material is subject to inspection, test, or rejection by the Engineer at any time.

During all periods of shipment and storage, wrap the geomembrane and fabric in a heavy-duty protective covering to protect the material from ultraviolet rays. After the protective wrapping has been removed, do not leave the material uncovered under any circumstances for longer than 4 days.

## 35

### Select Material

Provide select material meeting the requirements of Class III, Type 1 or Type 2, or Class V select material of Section 1016 of the *Standard Specifications*. When select material is required under water, use select material class V only, up to one foot above the existing water elevation.

### 4 inch Diameter Corrugated Drainage Pipe and Fittings

Provide pipe and fittings that meet all the applicable requirements of Section 815 or 816 of the *Standard Specifications*.

### Construction Methods

Place the geomembrane and fabric as shown on the plans or as directed by the Engineer. Perform the excavation for the fabric reinforced fill to the limits shown on the plans. Provide an excavated surface free of obstructions, debris, pockets, stumps, and cleared of all vegetation. The geomembrane or fabric will be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, handling or storage. Lay all layers smooth, and free from tension, stress, folds, wrinkles or creases. Place all the fabric layers with the machine direction (roll direction) parallel to the centerline of the roadway. A minimum roll width of 10.0 feet for the fabric is required. Overlap geomembrane or fabric splices parallel to the centerline of the roadway a minimum of 18 inches. Geomembrane or fabric splices parallel to the backwall face will not be allowed.

Deposit and spread select material in successive, uniform, approximately horizontal layers of not more than 10 inches in depth, loose measurement, for the full width of the cross section, and keep each layer approximately level. Place and compact each layer of select material fill no more than 10 inches thick with low ground pressure equipment. Use hand operated equipment to compact the fill material within three feet of the backwall and wingwalls as directed by the Engineer. Compact select material to a density equal to at least 95% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by the Department. Compact the top eight inches of select material to a density to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by the Department. Density requirements are not applicable to select material, class V; however compact the fill with at least four passes of low ground pressure equipment on the entire surface as directed by the Engineer. The compaction of each layer of select material shall be inspected and approved by the Department prior to the placement of the next fill layer. No equipment will be allowed to operate on the drainage pipe or any geomembrane/fabric layer until it is covered with at least six inches of fill material. Compaction shall not damage the drainage pipe, geomembrane, or fabric under the fill. Cover the geomembrane/fabric with a layer of fill material within four days after placement of the geomembrane/fabric. Geomembrane and fabric that are damaged as a result of installation will be replaced as directed by the Department at no additional cost.

Place the geomembrane on the ground, and attach and secure it tightly to the vertical face of the backwall and wingwalls with adhesives, duct-tape, nails or any other method approved by the Engineer. Place the first fabric layer on the surface of the geomembrane with the same dimensions of the geomembrane. No material or void is allowed between the geomembrane and the first fabric layer. Place and fold the remaining fabric layers on the edges as shown on the plans or as directed by the Engineer. Provide vertical separation between fabric layers as specified on the plans. The number of fabric layers will be shown in the plans.

Place four inch diameter perforated drainage pipe along the base of the backwall and sloped to drain as shown on the plans. Completely wrap perforated drainage pipe and #78M stone with Type 2 Engineering Fabric as shown on the plan detail. Install a pipe sleeve through the bottom of or under the wing wall prior to placing concrete for the wing wall. The pipe sleeve shall be of adequate strength to withstand the wingwall load. Place the pipe sleeve in position to allow the drainage pipe to go through the wing wall with a proper slope. Connect four-inch diameter nonperforated (plain) drainage pipe with a coupling to the perforated pipe near the inside face of the wingwall. Place the nonperforated drainage pipe through the pipe sleeve, extend down to the toe of the slope and connect, to a ditch or other drainage systems as directed by the Engineer. For bridge approaches in cut sections where no side slope is available, direct the drainage pipe outlet to the end slope down to the toe using elbows as directed by the Engineer.

### Measurement and Payment

*Reinforced Bridge Approach Fill, Station \_\_\_\_\_* will be paid for at the contract lump sum price. Such price and payment will be full compensation for both approach fills at each bridge installation, including but not limited to furnishing, placing and compacting select material, furnishing and placing geomembrane and woven fabric, furnishing and placing pipe sleeve, drainage pipe, and stone, furnishing and installing concrete pads at the end of outlet pipes, excavation and any other items necessary to complete the work.

Payment will be made under:

| <b>Pay Item</b>                                | <b>Pay Unit</b> |
|--|-----------------|
| Reinforced Bridge Approach Fill, Station _____ | Lump Sum        |

### AGGREGATE BASE COURSE:

12-19-06

SP5 R03

Revise the *2006 Standard Specifications* as follows:

Page 5-11, Article 520-5 Hauling and Placing Aggregate Base Material, 6th paragraph, replace the first sentence with the following:

Base course that is in place on November 15 shall have been covered with a subsequent layer of pavement structure or with a sand seal. Base course that has been placed between November 16 and March 15 inclusive shall be covered within 7 calendar days with a subsequent layer of pavement structure or with a sand seal.

**ASPHALT PAVEMENTS - SUPERPAVE:**

(7-18-06) (Rev 9-19-06)

SP6 R01

Revise the *2006 Standard Specifications* as follows:

Page 6-2, Article 600-9 Measurement and Payment

Delete the second paragraph.

Page 6-12, 609-5(C)2(c) add after (AASHTO T 209):

*or ASTM D 2041*

Page 6-13, last line on page & Page 6-14, Subarticle 609-5(C)(2)(e), delete and substitute the following:

(e) Retained Tensile Strength (TSR) - (AASHTO T 283 Modified), add subarticle (1) Option 1 before the first paragraph.

(1) Option 1

Add subarticle (2) Option 2 and the following sentence as the first sentence of the second paragraph:

(2) Option 2

Mix sampled from truck at plant with one set of specimens prepared by the Contractor and then tested jointly by QA and QC at a mutually agreed upon lab site within the first 7 calendar days after beginning production of each new mix design.

Page 6-28, 610-3(A) Mix Design-General, third sentence of the fourth paragraph:

Substitute 20% for 15%

First, second and third sentences of the fifth paragraph:

Substitute 20% for 15%

Page 6-44, 610-8, third full paragraph, replace the first sentence with the following:

Use the 30 foot minimum length mobile grade reference system or the non-contacting laser or sonar type ski *with at least four referencing stations mounted on the paver at a minimum length of 24 feet* to control the longitudinal profile when placing the initial lanes and all adjacent lanes of all layers, including resurfacing and asphalt in-lays, unless otherwise specified or approved.

Page 6-54, Article 620-4, add the following pay item:

| <b>Pay Item</b>                              | <b>Pay Unit</b> |
|--|-----------------|
| Asphalt Binder for Plant Mix, Grade PG 70-28 | Ton             |



Page 6-69, Table 660-1 **Material Application Rates and Temperatures**, add the following:

| Type of Coat | Grade of Asphalt | Asphalt Rate<br>gal/yd <sup>2</sup> | Application<br>Temperature °F | Aggregate Size | Aggregate Rate<br>lb./sq. yd. Total |
|--------------|------------------|-------------------------------------|-------------------------------|----------------|-------------------------------------|
| Sand Seal    | CRS-2 or CRS-2P  | 0.22-0.30                           | 150-175                       | Blotting Sand  | 12-15                               |

Page 6-75, 660-9(B), add the following as sub-item (5)

(5) Sand Seal

Place the fully required amount of asphalt material in one application and immediately cover with the seal coat aggregate. Uniformly spread the fully required amount of aggregate in one application and correct all non-uniform areas prior to rolling.

Immediately after the aggregate has been uniformly spread, perform rolling.

When directed, broom excess aggregate material from the surface of the seal coat.

When the sand seal is to be constructed for temporary sealing purposes only and will not be used by traffic, other grades of asphalt material meeting the requirements of Articles 1020-6 and 1020-7 may be used in lieu of the grade of asphalt required by Table 660-1 when approved.

Page 10-41, Table 1012-1, add the following:

| Mix Type | Course Aggregate<br>Angularity <sup>(b)</sup> ASTM | Fine Aggregate Angularity<br>% Minimum AASHTO<br>T304 Method A | Sand Equivalent<br>% Minimum<br>AASHTO T176 | Flat & Elongated 5:1 Ratio<br>% Maximum ASTM<br>D4791 Section 8.4 |
|----------|--|--|---|---|
| S 9.5 D  | D5821<br>100/100                                   | 45   | 50  | 10  |

Page 10-45, Replace Table 1012-2 with the following:

**TABLE 1012-2**  
**NEW SOURCE RAP GRADATION and BINDER TOLERANCES**  
 (Apply Tolerances to Mix Design Data)

| Mix Type           | 0-20% RAP  |      |        | 21-25% RAP |      |        | 26%+ RAP |      |        |       |
|--------------------|------------|------|--------|------------|------|--------|----------|------|--------|-------|
|                    | Sieve (mm) | Base | Inter. | Surf.      | Base | Inter. | Surf.    | Base | Inter. | Surf. |
| P <sub>b</sub> , % |            |      | ± 0.7% |            |      | ± 0.4% |          |      | ± 0.3% |       |
| 1 1/2" (37.5)      | ±10        | -    | -      | ±7         | -    | -      | ±5       | -    | -      |       |
| 3/4" (19.0)        | ±10        | ±10  | -      | ±7         | ±7   | -      | ±5       | ±5   | -      |       |
| 1/2" (12.5)        | -          | ±10  | ±6     | -          | ±7   | ±3     | -        | ±5   | ±2     |       |
| 3/8" (9.5)         | -          | -    | ±8     | -          | -    | ±5     | -        | -    | ±4     |       |
| No. 4 (4.75)       | ±10        | -    | ±10    | ±7         | -    | ±7     | ±5       | -    | ±5     |       |
| No. 8 (2.36)       | ±8         | ±8   | ±8     | ±5         | ±5   | ±5     | ±4       | ±4   | ±4     |       |
| No.16 (1.18)       | ±8         | ±8   | ±8     | ±5         | ±5   | ±5     | ±4       | ±4   | ±4     |       |
| No. 30 (0.600)     | ±8         | ±8   | ±8     | ±5         | ±5   | ±5     | ±4       | ±4   | ±4     |       |
| No. 50 (0.300)     | -          | -    | ±8     | -          | -    | ±5     | -        | -    | ±4     |       |
| No. 200 (0.075)    | ±4         | ±4   | ±4     | ±2         | ±2   | ±2     | ±1.5     | ±1.5 | ±1.5   |       |

**ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES:**

(11-21-00)

SP6 R15

The approximate asphalt binder content of the asphalt concrete plant mixtures used on this project will be as follows:

|                                      |               |      |
|--------------------------------------|---------------|------|
| Asphalt Concrete Base Course         | Type B 25.0__ | 4.3% |
| Asphalt Concrete Intermediate Course | Type I 19.0__ | 4.7% |
| Asphalt Concrete Surface Course      | Type S 4.75A  | 7.0% |
| Asphalt Concrete Surface Course      | Type SF 9.5A  | 6.5% |
| Asphalt Concrete Surface Course      | Type S 9.5__  | 6.0% |
| Asphalt Concrete Surface Course      | Type S 12.5__ | 5.5% |

The actual asphalt binder content will be established during construction by the Engineer within the limits established in the *Standard Specifications*.

**ASPHALT PLANT MIXTURES:**

(7-1-95)

SP6 R20

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

**PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:**

(11-21-00)

SP6 R25

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the *Standard Specifications*.

The base price index for asphalt binder for plant mix is **\$307.86** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on March 1, 2007.

**GUARDRAIL ANCHOR UNITS, TYPE 350:**

(4-20-04)

SP8 R65

**Description**

Furnish and install guardrail anchor units in accordance with the details in the plans, the applicable requirements of Section 862 of the *Standard Specifications*, and at locations shown in the plans.

**Materials**

The Contractor may at his option, furnish any one of the guardrail anchor units.

Guardrail anchor unit (ET-2000) as manufactured by:

Trinity Industries, Inc.  
2525 N. Stemmons Freeway  
Dallas, Texas 75207  
Telephone: 800-644-7976

The guardrail anchor unit (SKT 350) as manufactured by:

Road Systems, Inc.  
3616 Old Howard County Airport  
Big Spring, Texas 79720  
Telephone: 915-263-2435

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Section 106-2 of the Standard Specifications.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Section 105-2 of the Specifications.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

**Construction Methods**

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Section 1088-3 of the *Standard Specifications* and is incidental to the cost of the guardrail anchor unit.

**Measurement and Payment**

Measurement and payment will be made in accordance with Articles 862-6 of the *Standard Specifications*.

Payment will be made under:

|                                  |                 |
|----------------------------------|-----------------|
| <b>Pay Item</b>                  | <b>Pay Unit</b> |
| Guardrail Anchor Units, Type 350 | Each            |

**FENCE:**  
(3-6-06)

SP8 R86

Revise the 2006 *Standard Specifications* as follows:

Page 8-54, Subarticle 866-3(A), second sentence,

Add *existing fencing* after stumps

**PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON:**  
(10-15-02) (Rev 7-18-06)

SP8 R105

**Description**

Construct and maintain preformed scour holes with spreader aprons at the locations shown on the plans and in accordance with the details in the plans. Work includes excavation, shaping and maintaining the hole and apron, furnishing and placing filter fabric, rip rap (class as specified in the plans) and permanent soil reinforcement matting.

**Materials**

| <b>Item</b>   | <b>Section</b> |
|---------------|----------------|
| Plain rip rap | 1042           |
| Filter Fabric | 1056           |

The permanent soil reinforcement matting shall be permanent erosion control reinforcement mat and shall be constructed of 100% coconut fiber stitch bonded between a heavy duty UV stabilized cusped (crimped) netting overlaid with a heavy duty UV stabilized top net. The three nettings shall be stitched together on 1.5 inch centers UV stabilized polyester thread to form a permanent three dimensional structure. The mat shall have the following physical properties:

| <i>Property</i>                           | <i>Test Method</i> | <i>Value Unit</i> |
|---|--------------------|-------------------|
| Ground Cover                              | Image Analysis     | 93 %              |
| Thickness                                 | ASTM D1777         | 0.63 in           |
| Mass Per Unit Area                        | ASTM D3776         | 0.92 lb/sy        |
| Tensile Strength                          | ASTM D5035         | 480 lb/ft         |
| Elongation                                | ASTM D5035         | 49 %              |
| Tensile Strength                          | ASTM D5035         | 960 lb/ft         |
| Elongation                                | ASTM D5035         | 31 %              |
| Tensile Strength                          | ASTM D1682         | 177 lbs           |
| Elongation                                | ASTM D1682         | 22 %              |
| Resiliency                                | ASTM D1777         | >80 %             |
| UV Stability *                            | ASTM D4355         | 151 lbs           |
| Color(Permanent Net)                      |                    | UV Black          |
| Porosity (Permanent Net)                  | Calculated         | >95 %             |
| Minimum Filament Diameter (permanent net) | Measured           | 0.03 in           |

\*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure in a Xenon-arc weatherometer.

A certification (Type 1, 2, or 3) from the manufacturer showing:

- (A) the chemical and physical properties of the mat used, and
- (B) conformance of the mat with this specification will be required.

**Soil Preparation**

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

**Measurement and Payment**

*Performed Scour Holes with Level Spreader Aprons* will be measured and paid for shall be the actual number that has been incorporated into the completed and accepted work. Such price and payment will be full compensation for all work covered by this provision.

Payment will be made under:

| <b>Pay Item</b>                                 | <b>Pay Unit</b> |
|---|-----------------|
| Performed Scour Hole with Level Spreader Aprons | Each            |

**STREET SIGNS AND MARKERS AND ROUTE MARKERS:**

(7-1-95)

SP9 R01

Move any existing street signs, markers, and route markers out of the construction limits of the project and install the street signs and markers and route markers so that they will be visible to the traveling public if there is sufficient right of way for these signs and markers outside of the construction limits.

Near the completion of the project and when so directed by the Engineer, move the signs and markers and install them in their proper location in regard to the finished pavement of the project.

Stockpile any signs or markers that cannot be relocated due to lack of right of way, or any signs and markers that will no longer be applicable after the construction of the project, at locations directed by the Engineer for removal by others.

The Contractor shall be responsible to the owners for any damage to any street signs and markers or route markers during the above described operations.

No direct payment will be made for relocating, reinstalling, and/or stockpiling the street signs and markers and route markers as such work shall be considered incidental to other work being paid for by the various items in the contract.

**STEEL U-CHANNEL POSTS:**

(7-18-06)

SP9 R02

Amend the *2006 Standard Specifications* as follows:

Page 9-15 Subarticle 903-3(D) first paragraph, last sentence, delete the last sentence and add the following:

Use posts of sufficient length to permit the appropriate sign mounting height. Spliced posts are not permitted on new construction.

**HIGH STRENGTH CONCRETE FOR DRIVEWAYS:**

(11-21-00) (7-18-06)

SP10 R01

Use high early strength concrete for all driveways shown in the plans and as directed by the Engineer. Provide high early strength concrete that meets the requirements of Article 1000-6 of the *Standard Specifications*.

Measurement and payment will be in accordance with Section 848 of the *Standard Specifications*.

**AGGREGATE PRODUCTION:**

(11-20-01)

SP10 R05

Provide aggregate from a producer who uses the current Aggregate Quality Control/Quality Assurance Program that is in effect at the time of shipment.

No price adjustment is allowed to contractors or producers who use the program. Participation in the program does not relieve the producer of the responsibility of complying with all requirements of the *Standard Specifications*. Copies of this procedure are available upon request from the Materials and Test Unit.

**CONCRETE BRICK AND BLOCK PRODUCTION:**

(11-20-01)

SP10 R10

Provide concrete brick and block from a producer who uses the current Solid Concrete Masonry Brick/Unit Quality Control/Quality Assurance Program that is in effect on the date that material is received on the project.

No price adjustment is allowed to contractors or producers who use the program. Participation in the program does not relieve the producer of the responsibility of complying with all requirements of the *Standard Specifications*. Copies of this procedure are available upon request from the Materials and Test Unit.

**PORTLAND CEMENT CONCRETE (Alkali-Silica Reaction):**

2-20-07

SP10 R16

Revise the 2006 *Standard Specifications* as follows:

Article 1024-1(A), replace the 2nd paragraph with the following:

Certain combinations of cement and aggregate exhibit an adverse alkali-silica reaction. The alkalinity of any cement, expressed as sodium-oxide equivalent, shall not exceed 1.0 percent. For mix designs that contain non-reactive aggregates and cement with an alkali content less than 0.6%, straight cement or a combination of cement and fly ash, cement and ground granulated blast furnace slag or cement and microsilica may be used. The pozzolan quantity shall not exceed the amount shown in Table 1024-1. For mixes that contain cement with an alkali content between 0.6% and 1.0%, and for mixes that contain a reactive aggregate documented by the Department, regardless of the alkali content of the cement, use a pozzolan in the amount shown in Table 1024-1.

Obtain the list of reactive aggregates documented by the Department at: <http://www.ncdot.org/doh/operations/materials/pdf/quarryasprob.pdf>

| <b>Pozzolans for Use in Portland Cement Concrete</b> |  |
|--|--|
| <i>Pozzolan</i>                                      | <i>Rate</i>  |
| Class F Fly Ash                                      | 20% by weight of required cement content, with 1.2 lbs Class F fly ash per lb of cement replaced |
| Ground Granulated Blast Furnace Slag                 | 35%-50% by weight of required cement content with 1 lb slag per lb of cement replaced            |
| Microsilica  | 4%-8% by weight of required cement content, with 1 lb microsilica per lb of cement replaced      |

**GLASS BEADS:**

(7-18-06)

SP10 R35

Revise the *Standard Specifications* as follows:

Page 10-223, 1087-4(C) Gradation & Roundness

Replace the second sentence of the first paragraph with the following:

*All Drop-On and Intermixed Glass Beads shall be tested in accordance with ASTM D1155.*

Delete the last paragraph.

**ENGINEERING FABRICS TABLE 1056-1:**

(7-18-06)

SP10 R40

Revise the *Standard Specifications* as follows:

Page 10-100, Table 1056-1, replace the values for Trapezoidal Tear Strength with the following:

| Physical Property         | ASTM Test Method | Type 1         | Type 2       | Type 3               |         | Type 4             |
|---------------------------|------------------|----------------|--------------|----------------------|---------|--------------------|
|                           |                  |                |              | Class A              | Class B |                    |
| Typical Applications      |                  | Shoulder Drain | Under Riprap | Temporary Silt Fence |         | Soil Stabilization |
| Trapezoidal Tear Strength | D4533            | 45 lb          | 75 lb        | --                   | --      | 75 lb              |



**PORTABLE CONCRETE BARRIER**

(2-20-07)

SP10 R50

The *2006 Standard Specifications* is revised as follows:

Page 10-245, Article 1090-1(A) General, add the following after the first sentence:

The requirement for approved galvanized connectors will be waived if the barrier remains the property of the Contractor.

**TEMPORARY SHORING:**

(2-20-07)

SP11 R02

**Description**

Design and construct temporary shoring in accordance with the contract. Temporary shoring includes standard shoring, temporary mechanically stabilized earth (MSE) walls and non-anchored temporary shoring. Trench boxes are not considered temporary shoring. "Standard shoring" refers to *standard temporary shoring* and *standard temporary MSE walls*. Notes on plans may restrict the use of one or both types of standard shoring. Notes on plans may also require or prohibit temporary MSE walls.

Unless noted otherwise on the plans, temporary shoring is required as shown on the plans and to maintain traffic. Temporary shoring to maintain traffic is defined as shoring necessary to provide lateral support to the side of an excavation or embankment parallel to an open travelway when a theoretical 2:1 (H:V) slope from the bottom of the excavation or embankment intersects the existing ground line closer than 5 ft from the edge of pavement of the open travelway.

This provision is not applicable to anchored temporary shoring or the installation of pipes, drop inlets and utilities unless noted otherwise on the plans. Provide all shoring submittals before beginning work.

**Materials****(A) Certifications, Storage and Handling**

Provide Type 7 Contractor's Certifications in accordance with Article 106-3 of the *Standard Specifications* for all shoring materials used with the exception of reinforcing fabrics and geogrids. Furnish Type 2 Typical Certified Mill Test Reports in accordance with Article 106-3 of the *Standard Specifications* for all seam strengths and reinforcing fabric and geogrid properties. Provide minimum average roll values (MARV) in accordance with ASTM D4759 for test reports. For testing reinforcing fabric and geogrids, a lot is defined as a single day's production.

Load, transport, unload and store shoring materials such that they are kept clean and free of damage. Identify, store and handle all geogrids and geotextile fabrics in accordance with ASTM D4873. Geogrids and fabrics with defects, flaws, deterioration or damage will be rejected. Do not leave fabrics or geogrids uncovered for more than 7 days.

**(B) Shoring Backfill**

Use shoring backfill for the construction of all temporary shoring including backfilling behind non-anchored temporary shoring and in the reinforced zone for temporary MSE walls. Unless backfilling around culverts, use shoring backfill that meets the requirements of Class II Type I, Class III, Class V or Class VI select material in accordance with Section 1016 of the *Standard Specifications* or AASHTO M145 for soil classification A-2-4 with a maximum plasticity index (PI) of 6. For backfilling around culverts, use shoring backfill as defined herein except for A-2-4 soil.

**(C) Non-anchored Temporary Shoring**

Use steel shapes, plates and piles that meet the requirements of ASTM A36 and steel sheet piles that meet the requirements of Article 1084-2 of the *Standard Specifications*. Use timber lagging with a minimum allowable bending stress of 1000 psi that meets the requirements of Article 1082-1 of the *Standard Specifications*. For standard temporary shoring, use pile sections and lengths and lagging sizes as shown on the plans.

**(D) Temporary MSE Walls**

Use welded wire reinforcement forms, facings, mesh and mats that meet the requirements of AASHTO M55 or M221. Use connector bars and wires for welded wire wall components and support struts that meet the requirements of AASHTO M32. For standard temporary MSE walls, use wire gauges, strut sizes and welded wire components as shown on the plans.

**(1) Geotextile Fabrics**

Use geotextile fabrics that meet the requirements of Article 1056-1 of the *Standard Specifications*.

**(a) Reinforcing Fabric**

The reinforcement direction (RD) is defined as the direction perpendicular to the wall face and the cross-reinforcement direction (CRD) is defined as the direction parallel to the wall face.

Use woven polyester or polypropylene fabric that meets the following properties:

| <b>Property</b>                              | <b>Test Method</b> | <b>Requirement (MARV)</b> |
|--|--------------------|---------------------------|
| Wide Width Tensile Strength @ Ultimate (RD)  | ASTM D4595         | Varies –<br>200 lb/in min |
| Wide Width Tensile Strength @ Ultimate (CRD) | ASTM D4595         | 100 lb/in min             |
| Trapezoidal Tear Strength                    | ASTM D4533         | 100 lb min                |
| CBR Puncture Strength                        | ASTM D6241         | 600 lb min                |
| UV Resistance after 500 hrs                  | ASTM D4355         | 70 %                      |
| Apparent Opening Size (AOS), US Sieve        | ASTM D4751         | 20 min – 70 max           |
| Permittivity                                 | ASTM D4491         | 0.20 sec <sup>-1</sup>    |

For standard temporary MSE walls (temporary fabric wall) use reinforcing fabric wide width tensile strengths and lengths in the RD as shown on the plans.

**(b) Retention Fabric**

Retain shoring backfill at the face of temporary MSE walls with retention fabric. Use fabric that meets the requirements of Class 3 and the UV resistance, AOS and permittivity for separation geotextile in accordance with AASHTO M288.

**(2) SierraScape Temporary Wall**

Use uniaxial (UX) geogrids composed of high-density polyethylene (HDPE) manufactured by Tensar Earth Technologies. Test geogrids in accordance with ASTM D6637. Use connection rods manufactured by Tensar Earth Technologies to transfer the load between the facings and geogrids.

For standard temporary MSE walls (SierraScape temporary wall) use geogrid types and lengths as shown on the plans.

**(3) Terratrel Temporary Wall**

Use ribbed reinforcing steel strips manufactured by The Reinforced Earth Company that meet the requirements of ASTM A572, Grade 65. Use connector rods that meet the requirements of AASHTO M31, Grade 60 and hair pin connectors that meet the requirements of ASTM A1011, Grade 50. Use bolts, nuts and washers that meet the requirements of AASHTO M164.

For standard temporary MSE walls (Terratrel temporary wall) use ribbed steel strip size and lengths, rod lengths and diameters, hairpin connectors, bolts, nuts and washers as shown on the plans.

### **Embedment**

“Embedment” is defined as the depth of shoring below the bottom of the excavation or the grade in front of the shoring. For cantilever shoring, embedment is the depth of the piling below the grade in front of the shoring. For temporary MSE walls, embedment is the difference between the grade elevation in front of the wall and the elevation of the bottom of the reinforced zone.

### **Portable Concrete Barriers**

Provide portable concrete barriers in accordance with the plans and if shoring is located within the clear zone as defined in the *AASHTO Roadside Design Guide*. Use NCDOT portable concrete barriers (PCBs) in accordance with Roadway Standard Drawing No. 1170.01 and Section 1170 of the *Standard Specifications*. Use Oregon Tall F-Shape Concrete Barriers in accordance with detail drawing and special provision obtained from:

<http://www.ncdot.org/doh/preconstruct/wztc/DesRes/English/DesResEng.html>

The clear distance is defined as the horizontal distance from the back face of the barrier to the edge of pavement and the minimum required clear distance is shown on the traffic control plans. At the Contractor’s option or if the minimum required clear distance is not available, set an unanchored PCB against the traffic side of the shoring and design shoring for traffic impact or use the “surcharge case with traffic impact” for the standard temporary shoring. An anchored PCB or Oregon barrier is required for barriers above and behind temporary MSE walls.

### **Contractor Designed Shoring**

“Contractor designed shoring” is defined as non-anchored temporary shoring or temporary MSE walls designed by the Contractor. Unless prohibited or required, Contractor designed shoring is optional. Contractor designed shoring is required when notes on plans prohibit the use of standard shoring. Non-anchored Contractor designed shoring is prohibited when notes on plans require the use of temporary MSE walls and Contractor designed temporary MSE walls are prohibited when notes on plans prohibit the use of temporary MSE walls.

Before beginning design, survey the shoring location to determine existing elevations and actual design heights. Submit design calculations and drawings including typical sections for review and acceptance showing details of the proposed design and construction sequence in accordance with Article 105-2 of the *Standard Specifications*. Have shoring designed, detailed and sealed by a Professional Engineer registered in the State of North Carolina. Submit 3 hard copies of design calculations and 10 hard copies of drawings and an electronic copy (pdf or jpeg format on CD or DVD) of both the calculations and drawings.

Design non-anchored temporary shoring in accordance with the *AASHTO Guide Design Specifications for Bridge Temporary Works* and temporary MSE walls in accordance with the *AASHTO Allowable Stress Design Standard Specifications for Highway Bridges*. Use the following soil parameters for shoring backfill in the reinforced zone.

Total Unit Weight = 120 pcf  
Friction Angle = 30 degrees  
Cohesion = 0 psf

Design temporary shoring in accordance with the in-situ assumed soil parameters shown on the plans. Design shoring for a 3-year design service life and a traffic surcharge equal to 240 psf. This surcharge is not applicable for construction traffic. If a construction surcharge will be present within a horizontal distance equal to the height of the shoring, design the shoring for the required construction surcharge. If the edge of pavement or a structure to be protected is within a horizontal distance equal to the height of the shoring, design shoring for a maximum deflection of 3". Otherwise, design shoring for a maximum deflection of 6".

For non-anchored temporary shoring, the top of shoring elevation is defined as the elevation where the grade intersects the back face of the shoring. For traffic impact, apply 2 kips/ft to the shoring 1.5 ft above the top of shoring elevation. When designing for traffic impact, extend shoring at least 32" above the top of shoring elevation. Otherwise, extend shoring at least 6" above the top of shoring elevation.

### **Standard Shoring**

Unless notes on plans prohibit the use of one or both types of standard shoring, standard shoring is optional. Submit a "Standard Temporary MSE Wall Selection Form" for each standard temporary MSE wall location and a "Standard Temporary Shoring Selection Form" for up to three standard temporary shoring locations. Submit selection forms at least 14 days before beginning shoring construction. Obtain standard shoring selection forms from:

<http://www.ncdot.org/doh/preconstruct/highway/geotech/formprovdet/>

#### **(A) Standard Temporary Shoring**

Determine the shoring height, traffic impact, groundwater condition and slope or surcharge case for each standard temporary shoring location. Determine the minimum required extension, embedment and sheet pile section modulus or H pile section from the plans for each location.

#### **(B) Standard Temporary MSE Walls**

Choose a standard temporary MSE wall from the multiple temporary MSE wall options shown in the plans. Do not use more than one option per wall location.

Step bottom of reinforced zone in increments equal to vertical reinforcement spacing for the wall option chosen. Determine the wall height and slope or surcharge case for each section of standard temporary MSE wall. With the exception of either the first or last section of wall, use horizontal section lengths in increments equal to the following for the wall option chosen.

| Standard Temporary MSE Wall Option | Increment          |
|------------------------------------|--------------------|
| Temporary Fabric Wall              | 9 ft min (varies)  |
| Hilfiker Temporary Wall            | 10 ft min (varies) |
| SierraScape Temporary Wall         | 18 ft – 7 ¼ in     |
| Retained Earth Temporary Wall      | 24 ft              |
| Terratrel Temporary Wall           | 19 ft – 8 in       |

Determine the appropriate facings and/or forms and reinforcement length, spacing, strength, type, density and/or size from the plans for each wall section.

**Construction Methods**

When using an anchored PCB, anchor the barrier in accordance with Roadway Standard Drawing 1170.01 and Section 1170 of the *Standard Specifications*. Control drainage during construction in the vicinity of temporary shoring. Collect and direct run off away from temporary MSE walls, shoring and shoring backfill.

**(A) Non-anchored Temporary Shoring**

Install and interlock sheet piling or install piles as shown on the plans or accepted submittals with a tolerance of 1/2 inch per foot from vertical. Contact the Engineer if the design embedment is not achieved. If piles are placed in drilled holes, perform pile excavation to the required elevations and backfill excavations with concrete and lean sand grout.

Remove grout as necessary to install timber lagging. Install timber lagging with a minimum bearing distance of 3” on each pile flange. Backfill voids behind lagging with shoring backfill.

Perform welding in accordance with the accepted submittals and Article 1072-20 of the *Standard Specifications*.

**(1) Pile Excavation**

Excavate a hole with a diameter that will result in at least 3” of clearance around the entire pile. Use equipment of adequate capacity and capable of drilling through soil and non-soil including rock, boulders, debris, man-made objects and any other materials encountered. Blasting is not permitted to advance excavations. Blasting for core removal is permitted only when approved by the

Engineer. Dispose of drilling spoils in accordance with Section 802 of the *Standard Specifications*. Drilling spoils consist of all excavated material including water removed from excavations by either pumping or drilling tools.

If unstable, caving or sloughing soils are encountered, stabilize excavations with clean watertight steel casing. Steel casings may be either sectional type or one continuous corrugated or non-corrugated piece. Provide casings of ample strength to withstand handling and driving stresses and the pressures imposed by concrete, earth or backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of 1/4 inch.

Before placing concrete, check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than 6" per half hour, remove any water and free fall the concrete into the excavation. Ensure that concrete flows completely around the pile. If the water inflow rate is greater than 6" per half hour, propose and obtain approval of the concrete placement procedure before placing concrete.

Center the pile in the excavation and fill the excavation with Class A concrete in accordance with Section 1000 of the *Standard Specifications* except as modified herein. Provide concrete with a slump of 6 to 8 inches. Use an approved high-range water reducer to achieve this slump. Place concrete in a continuous manner to the bottom of shoring or the elevations shown on the accepted submittals. Fill the remainder of the excavation with a lean sand grout and remove all casings.

**(B) Temporary MSE Walls**

The Engineer may require a wall preconstruction meeting to discuss the construction and inspection of the temporary MSE walls. If required, conduct the meeting with the Site Superintendent, the Resident or Bridge Maintenance Engineer, the Bridge Construction Engineer and the Geotechnical Operations Engineer before beginning wall construction.

Perform all necessary clearing and grubbing in accordance with Section 200 of the *Standard Specifications*. Excavate as necessary as shown on the plans or accepted submittals. Notify the Engineer when foundation excavation is complete. Do not place shoring backfill or first reinforcement layer until obtaining approval of the excavation depth and checking foundation material for in-situ assumed soil parameters.

If applicable, install foundations located within the reinforced zone in accordance with the plans or accepted submittals.

Erect and maintain facings and forms as shown on the plans or accepted submittals. Stagger vertical joints of facings and forms to create a running bond when possible unless shown otherwise on the plans or accepted submittals.

Place facings and forms as near to vertical as possible with no negative batter. Construct temporary MSE walls with a vertical and horizontal tolerance of 3" when measured with a 10 ft straight edge and an overall vertical plumbness (batter) and horizontal alignment of less than 6".

Place reinforcement at locations and elevations shown on the plans or accepted submittals and in slight tension free of kinks, folds, wrinkles or creases. Repair or replace any damaged reinforcement. Contact the Engineer when existing or future structures such as foundations, pavements, pipes, inlets or utilities will interfere with reinforcement. To avoid structures, deflect, skew and modify reinforcement.

Do not splice reinforcement in the reinforcement direction (RD), i.e., parallel to the wall face. Seams are allowed in the cross-reinforcement direction (CRD). Bond or sew adjacent reinforcing fabric together or overlap fabric a minimum of 18" with seams oriented perpendicular to the wall face.

Place shoring backfill in 8 to 10 inch thick lifts and compact in accordance with Subarticle 235-4(C) of the *Standard Specifications*. Use only hand operated compaction equipment within 3 ft of the wall face. Do not damage reinforcement when placing and compacting shoring backfill. End dumping directly on the reinforcement is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 10" of shoring backfill. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet.

Cover reinforcing and retention fabric with at least 3" of shoring backfill. Place top reinforcement layer between 4 and 24 inches below top of wall as shown on the plans or accepted submittals.

Bench temporary MSE walls into the sides of excavations where applicable. If the top of wall is within 5 ft of finished grade, remove top form or facing and incorporate the top reinforcement layer into the fill when placing fill in front of the wall. Temporary MSE walls remain in place permanently unless required otherwise.

### **Measurement and Payment**

*Temporary Shoring* will be measured and paid for at the contract unit price per square feet of exposed face area at locations shown on the plans or required by the Engineer. For temporary MSE walls, the wall height will be measured as the difference between the top and bottom of wall and does not include the embedded portions of the wall or any pavement thickness above the wall. For all other temporary shoring, the shoring height will be measured as the difference between the top and bottom of shoring elevation. The bottom of shoring elevation is defined as where the grade intersects the front face of the shoring. The top of shoring elevation is defined as where the grade intersects the back face of the shoring. No payment will be made for any extension of shoring above the top of shoring or any embedment below the bottom of shoring. Such price and payment will be full compensation for furnishing all labor, tools, equipment,



materials and all incidentals necessary to design and install the temporary shoring and complete the work as described in this provision.

No payment will be made for temporary shoring not shown on the plans or required by the Engineer including shoring for OSHA reasons or the Contractor's convenience. No value engineering proposals will be accepted based solely on revising or eliminating the shoring locations shown on the plans or the estimated quantities shown in the bid item sheets as a result of actual field measurements or site conditions.

No additional payment will be made for anchored PCBs or Oregon barriers above and behind temporary shoring. Additional costs for anchoring or Oregon barriers will be considered incidental to *Temporary Shoring*.

Payment will be made under:

| <b>Pay Item</b>   | <b>Pay Unit</b> |
|-------------------|-----------------|
| Temporary Shoring | Square Foot     |

**REINFORCED SLOPE:**

1. DESCRIPTION

This work consists of furnishing and installing synthetic fabric reinforcement for stabilizing the steepened embankment slope in accordance with these provisions and the plans and as directed by the Engineer. Place riprap on the face of the reinforced slope at the locations indicated in the plans. A preconstruction conference shall be scheduled with representatives of the Contractor, Resident Engineer, and Geotechnical Engineering Unit to discuss construction details and quality control measures.

2. MATERIALS

2.1 Fabric

The fabric shall be composed of strong rot-proof synthetic fibers formed into a fabric of the woven type. The fabric shall be free of any treatment or coating which might significantly alter its physical properties after installation. The fabric shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration resulting from ultraviolet or heat exposure. The fabric shall be a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative position with respect to each other. The edges of the fabric shall be finished to prevent the outer yarn from pulling away from the fabric. The fabric shall be free of defects or flaws which significantly affect its physical and/or filtering properties. Lamination of fabric shall not be allowed.

During all periods of shipment and storage, the fabric shall be wrapped in a heavy duty protective covering to protect the fabric from direct sunlight, ultraviolet rays, mud, dust, dirt, and debris. The fabric shall not be exposed to temperatures greater than 140°F. After the protective wrapping has been removed, the fabric shall not be left uncovered under any circumstances for longer than one (1) week.

The fabric shall meet the following physical requirements:

All values represent minimum average roll values (any roll in a lot should meet or exceed the minimum values in this table).

| <u>Fabric Property</u>   | <u>Test Method</u> | <u>Requirements</u>                                 |
|--|--------------------|---|
| Wide Width Tensile<br>Direction)<br>Strength at 5%<br>Elongation | ASTM D-4595        | 1000 lb/ft (Machine and Cross Machine               |
| Ultimate Wide Width<br>Direction)<br>Tensile Srength             | ASTM D-4595        | 2200 lb/ft (Machine and Cross Machine               |
| <u>Fabric Property</u>   | <u>Test Method</u> | <u>Requirements</u>                                 |
| <b>Puncture Strength</b>   |                    | <b>ASTM D-4833      130 lb. Minimum</b>             |
| <b>Trapezoid Tear</b><br>Direction                               | <b>ASTM D-4533</b> | <b>100 lb. Minimum</b><br>Machine and Cross Machine |
| <b>Bursting Strength</b><br>(Mullen)                             | (Diaphragm Method) | <b>ASTM D-3786,      450 psi Minimum</b>            |
| AOS, U.S. Std.<br>Sieve  | ASTM D-4751        | 20 min.- 70 max.                                    |
| Permeability   | ASTM D-4491        | 0.00787 in./sec.                                    |
| <b>Ultraviolet (UV)</b><br>% Strength Retained                   |                    | <b>ASTM D-4355      70% Minimum</b>                 |

The Contractor shall furnish certified test reports by an approved independent testing laboratory with each shipment of material attesting that the fabric meets the requirements of this provision; however, the material shall be subject to inspection, test, or rejection by the Engineer at any time. The Contractor shall furnish the Engineer certified test reports by an independent testing laboratory attesting that the sewn seam provides the strength properties required for the fabric.

## 2.2 Select Material

Select material shall be Select Material Class III in Section 1016 of the NCDOT Standard Specifications.

## 2.3 Riprap

Rip rap shall meet the requirements of Plain Rip Rap, Class II in Section 1042 of the NCDOT Standard Specifications.

## 3. CONSTRUCTION

The fabric shall be placed at locations as shown on the plans or as directed by the Engineer. The excavated surface shall be free of obstructions, debris, pockets, stumps, and cleared of all vegetation.

At the time of installation, the fabric shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, or storage.

The fabric shall be laid smooth and free from tension, stress, folds, wrinkles or creases. Fabric sheets shall be rolled out perpendicular to the face of the slope. No splices will be allowed parallel to the slope face. Adjacent sheets of fabric shall be overlapped a minimum of 18 inches. Adjacent panels may be seamed with the seam oriented perpendicular to the slope face. Seam strength shall be no less than the required strength in the machine direction - ASTM D-4884.

Should the geotextile be torn or punctured or the overlaps or sewn joints disturbed as evidenced by visible geotextile damage, subgrade pumping, intrusion, or distortion, the backfill around the damaged or displaced area shall be removed and the damaged area repaired or replaced by the Contractor at no cost to the State. The repair shall consist of a patch of the same type of geotextile which replaces the ruptured area. All geotextile within 1 foot of the ruptured area shall be removed from the smooth geotextile edge in such a way as to not cause additional ripping or tearing. The patch shall be sewn onto the geotextile.

The class III select material shall be compacted to a dry density of 95% of the maximum dry density determined in accordance with AASHTO T99 as modified by the Department. Compaction within 3 feet of the slope face shall be performed with light compaction equipment such as mechanical tampers and vibro plates. Every effort shall be made to avoid damaging the fabric when placing and compacting the backfill material. Heavy equipment shall not be allowed to operate on the fabric until it is covered with 1 foot of backfill material. End dumping fill directly on the geotextile will not be permitted. Sheepsfoot rollers or other rollers with protrusions as well as vibratory rollers shall not be used over the fabric.

A forming system at the fabric face is required to allow compaction of the backfill material against the vertical face of the fabric. Two options are included in the plans. The first option is a removable temporary falsework option; the second option is a welded wire mesh stay-in-place form option. If the Contractor elects to use another alternative to form the fabric face, it shall be submitted to the Engineer for review. The fabric shall be stepped as shown on the plans as close as possible.

The embankment fill is required to be brought up as the slope is brought up. All fabric which is damaged as a result of installation will be required to be replaced at the discretion of the Engineer with no additional cost to the Department.

Place rip rap on slope face carefully in order to avoid damage to the fabric.

#### 4. FACE OF SLOPE

Rip rap shall be placed as shown on the plans.

#### 5. METHOD OF MEASUREMENT

The quantity of fabric to be paid for will be the actual number of square yards of the material used in the work as specified.

The quantity of select material class III to be paid for will be the actual number of cubic yards of this material which has been placed as backfill within the limits of the reinforced slope as directed by the Engineer.

The quantity of riprap to be paid for will be the actual number of tons of this material that has been placed on the slope face of the reinforced slope as directed by the Engineer.

#### 6. BASIS OF PAYMENT

The quantity of fabric, measured as provided above, will be paid for at the contract unit price per square yard, for "Fabric for Reinforced Slope". Such price and payment will be full compensation for all work covered by this provision, including but not limited to furnishing, hauling, placing, and sewing fabric.

The quantity of select material class III, measured as provided above will be paid for at the contract unit price per cubic yard for "Select Material Class III". Such price and payment will be considered full compensation for furnishing, hauling, excavating into existing ground, and compacting the backfill material necessary to complete the work satisfactorily.

The quantity of rip rap, measured as provided above will be paid for at the contract unit price per ton for "Plain Rip Rap, Class II". Such price and payment will be considered full compensation for furnishing, hauling, and placing the riprap necessary to complete the work satisfactorily.

Pay Items:

Fabric for Reinforced Slope  
Select Material Class III  
Plain Rip Rap, Class II

Square Yard  
Cubic Yard  
Ton

**CHANGEABLE MESSAGE SIGNS**

(11-21-06)

SP11 R11

Revise the *2006 Standard Specifications* as follows:

Page 11-9, Article 1120-3, Replace the 3rd sentence with the following:

Sign operator will adjust flash rate so that no more than two messages will be displayed and be legible to a driver when approaching the sign at the posted speed.

**ROCK PLATING:**

This work consists of rock plating fill slopes at locations shown on the plans and as directed by the Engineer.

The Contractor will be required to walk or track the slope with equipment capable of compacting the restored slopes to a degree satisfactory to the Engineer.

The fabric shall be placed by unrolling down the slope in a direction perpendicular to the centerline. Fabric shall be buried at the top and embedded at the bottom using dimensions and orientation as shown on the detail. It is preferable that the length of fabric down the slope be continuous. If length of fabric is not sufficient, such as at the end of a roll, an overlap of 3 ft. (915 mm) is required with the upper fabric placed over the lower as shown on the detail.

**FILTER FABRIC**

The filter fabric shall meet the physical requirements of Type 2 Engineering Fabric as stated in Section 1056 of the 2006 Standard Specifications.

**ROCK**

The rock shall be plain rip rap meeting the size requirements for Class II rip rap.

In placing the rock slope protection, the Contractor shall take care not to tear or damage the fabric and in no case shall the rock be allowed to fall from a height greater than 3 ft.

**MEASUREMENT AND PAYMENT**

The quantity of rock plating to be paid for will be the actual number of square yards of "Filter Fabric for Drainage" and tons of "Plain Rip Rap, Class II" which have been placed and accepted.

The quantity of rock plating will be paid for at the contract unit price per square yards of “Filter Fabric for Drainage” and tons of “Plain Rip Rap, Class II”. Such price shall be full compensation for all work and materials covered by this provision.

**PAVEMENT MARKING LINES MEASUREMENT AND PAYMENT:**

(11-21-06)

SP 12 R01

Revise the 2006 Standard Specifications as follows:

Page 12-14, Subarticle 1205-10, delete the first sentence of the first paragraph and replace with the following:

*Pavement Marking Lines* will be measured and paid for as the actual number of linear feet of pavement marking lines per application that has been satisfactorily placed and accepted by the Engineer.

**PERMANENT SEEDING AND MULCHING:**

(7-1-95)

SP16 R01

The Department desires that permanent seeding and mulching be established on this project as soon as practical after slopes or portions of slopes have been graded. As an incentive to obtain an early stand of vegetation on this project, the Contractor's attention is called to the following:

For all permanent seeding and mulching that is satisfactorily completed in accordance with the requirements of Section 1660, Seeding and Mulching, and within the following percentages of elapsed contract times, an additional payment will be made to the Contractor as an incentive additive. The incentive additive will be determined by multiplying the number of acres of seeding and mulching satisfactorily completed times the contract unit bid price per acre for Seeding and Mulching times the appropriate percentage additive.

| Percentage of<br>Elapsed Contract Time | Percentage<br>Additive |
|--|------------------------|
| 0% - 30%                               | 30%                    |
| 30.01% - 50%                           | 15%                    |

Percentage of elapsed contract time is defined as the number of calendar days from the date of availability of the contract to the date the permanent seeding and mulching is acceptably completed divided by the total original contract time.

**HDPE PIPE:**

(7-18-06)

SP3 R35

**Description**

The Contractor may furnish and install HDPE Pipe, and HDPE Pipe Elbows, Type S or Type D.

# 59-A

## Material

| <b>Item</b>            | <b>Section</b> |
|------------------------|----------------|
| HDPE Pipe, Type S or D | 1044-7         |

## Construction Methods

HDPE Pipe Culverts and HDPE Pipe Elbows shall be installed in accordance with the requirements of Section 300 of the *Standard Specifications* for Method A, except that the minimum cover shall be at least 12 inches. HDPE Pipe Culvert will not be permitted for use under travelways, including curb and gutter.

## Measurement and Payment

The quantity of \_\_\_\_\_ HDPE Pipe Elbows to be paid for will be the actual number per each installed and accepted. Measurement will be in accordance with Section 310-6 of the *Standard Specifications*.

The quantity of \_\_\_\_\_ "HDPE Pipe Culvert to be paid for will be the actual number of linear feet installed and accepted. Measurement will be in accordance with Section 310-6 of the *Standard Specifications*.

Payment will be made under:

| <b>Pay Item</b>            | <b>Pay Unit</b> |
|----------------------------|-----------------|
| _____ " HDPE Pipe Culverts | Linear Foot     |
| _____ " HDPE Pipe Elbows   | Each            |

## ALUMINUM ENDWALLS FOR FIVE AND FOUR PIPE CULVERT:

### Description

The Contractor shall construct aluminum endwalls in accordance with the detail in the plans, at the location shown in the plans and as directed.

### Measurement and Payment

Payment for aluminum endwalls for five or four pipe culvert will be made at the contract lump sum price. No measurement will be made. Such price and payment will be full compensation for all excavation, hauling and satisfactory disposal of earth material and all incidentals necessary to complete the work.

Payment will be made under:

| <b>Pay Item</b>                              | <b>Pay Unit</b> |
|--|-----------------|
| Aluminum Endwalls for Five Pipe Culvert..... | Lump Sum        |
| Aluminum Endwalls for Four Pipe Culvert..... | Lump Sum        |

**STORM CHAMBER:**

**Description:**

The Contractor’s attention is directed to the fact that he shall furnish and install Storm Chamber in accordance with the detail in the plans and as directed by the Engineer.

**Measurement and Payment**

The quantity of such work to be paid for will be the actual number of linear feet of Storm Chamber, which has been installed and accepted. The quantity will be paid for at the contract unit price per linear foot for “Storm Chamber”. Such price and payment will be full compensation for 57 Stone and all incidentals associated with performing this work.

Payment will be made under:

| <b>Pay Item</b>    | <b>Pay Unit</b> |
|--------------------|-----------------|
| Storm Chamber..... | Linear Foot     |

**FINAL SURFACE TESTING - ASPHALT PAVEMENTS (Rideability):**

(5-18-04) (Rev.7-18-06)

SP6 R45

On portions of this project where the typical section requires two or more layers of new pavement, perform acceptance testing of the longitudinal profile of the finished pavement surface in accordance with these provisions using a North Carolina Hearne Straightedge (Model No. 1). Furnish and operate the straightedge to determine and record the longitudinal profile of the pavement on a continuous graph. Final surface testing is an integral part of the paving operation and is subject to observation and inspection by the Engineer as deemed necessary.

Push the straightedge manually over the pavement at a speed not exceeding 2 miles per hour. For all lanes, take profiles in the right wheel path approximately 3 ft from the right edge of pavement in the same direction as the paving operation, unless otherwise approved due to traffic control or safety considerations. Make one pass of the straightedge in each full width travel lane. The full lane width should be comparable in ride quality to the area evaluated with the Hearne Straightedge. If deviations exist at other locations across the lane width, utilize a 10 foot non-mobile straightedge or the Hearne Straightedge to evaluate which areas may require corrective action. Take profiles as soon as practical after the pavement has been rolled and compacted but in no event later than 24 hours following placement of the pavement, unless otherwise authorized by the Engineer. Take profiles over the entire length of final surface travel lane pavement



exclusive of -Y- line travel lanes less than or equal to 300 feet in length, turn lanes less than or equal to 300 feet in length, structures, approach slabs, paved shoulders, loops, and tapers or other irregular shaped areas of pavement, unless otherwise approved by the Engineer. Test in accordance with this provision all mainline travel lanes, full width acceleration or deceleration lanes, -Y- line travel lanes greater than 300 feet in length, ramps, full width turn lanes greater than 300 feet in length, and collector lanes.

At the beginning and end of each day's testing operations, and at such other times as determined necessary by the Engineer, operate the straightedge over a calibration strip so that the Engineer can verify correct operation of the straightedge. The calibration strip shall be a 100 ft section of pavement that is reasonably level and smooth. Submit each day's calibration graphs with that day's test section graphs to the Engineer. Calibrate the straightedge in accordance with the current NCDOT procedure titled *North Carolina Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index*. Copies of this procedure may be obtained from the Department's Pavement Construction Section.

Plot the straightedge graph at a horizontal scale of approximately 25 ft per inch with the vertical scale plotted at a true scale. Record station numbers and references (bridges, approach slabs, culverts, etc.) on the graphs, and distances between references/stations must not exceed 100 ft. Have the operator record the Date, Project No., Lane Location, Wheel Path Location, Type Mix, and Operator's Name on the graph.

Upon completion of each day's testing, evaluate the graph, calculate the Cumulative Straightedge Index (CSI), and determine which lots, if any, require corrective action. Document the evaluation of each lot on a QA/QC-7 form. Submit the graphs along with the completed QA/QC-7 forms to the Engineer, within 24 hours after profiles are completed, for verification of the results. The Engineer will furnish results of their acceptance evaluation to the Contractor within 48 hours of receiving the graphs. In the event of discrepancies, the Engineer's evaluation of the graphs will prevail for acceptance purposes. The Engineer will retain all graphs and forms.

Use blanking bands of 0.2 inches, 0.3 inches, and 0.4 inches to evaluate the graph for acceptance. The 0.2 inch and 0.3 inch blanking bands are used to determine the Straightedge Index (SEI), which is a number that indicates the deviations that exceed each of the 0.2 inch and 0.3 inch bands within a 100 ft test section. The Cumulative Straightedge Index (CSI) is a number representing the total of the SEIs for one lot, which consist of not more than 25 consecutive test sections. In addition, the 0.4 inch blanking band is used to further evaluate deviations on an individual basis. The Cumulative Straightedge Index (CSI) will be determined by the Engineer in accordance with the current procedure titled "North Carolina Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index".

The pavement will be accepted for surface smoothness on a lot by lot basis. A test section represents pavement one travel lane wide not more than 100 ft in length. A lot will consist of 25 consecutive test sections, except that separate lots will be established for each travel lane, unless otherwise approved by the Engineer. In addition, full width acceleration or deceleration lanes, ramps, turn lanes, and collector lanes, will be evaluated as separate lots. For any lot that is

less than 2500 feet in length, the applicable pay adjustment incentive will be prorated on the basis of the actual lot length. For any lot which is less than 2500 feet in length, the applicable pay adjustment disincentive will be the full amount for a lot, regardless of the lot length.

If during the evaluation of the graphs, 5 lots (mainline travel lanes and full width -Y- line travel lanes greater than 300 feet in length only require corrective action, then proceed on limited production for unsatisfactory laydown in accordance with Article 610-12 of the *Standard Specifications*. Proceeding on limited production is based upon the Contractor's initial evaluation of the straightedge test results and must begin immediately upon obtaining those results. Additionally, the Engineer may direct the Contractor to proceed on limited production in accordance with Article 610-12 due to unsatisfactory laydown or workmanship.

Limited production for unsatisfactory laydown is defined as being restricted to the production, placement, compaction, and final surface testing of a sufficient quantity of mix necessary to construct only 2500 feet of pavement at the laydown width. Once this lot is complete, the final surface testing graphs will be evaluated jointly by the Contractor and the Engineer. Remain on limited production until such time as acceptable laydown results are obtained or until three consecutive 2500 foot sections have been attempted without achieving acceptable laydown results. The Engineer will determine if normal production may resume based upon the CSI for the limited production lot and any adjustments to the equipment, placement methods, and/or personnel performing the work. Once on limited production, the Engineer may require the Contractor to evaluate the smoothness of the previous asphalt layer and take appropriate action to reduce and/or eliminate corrective measures on the final surface course. Additionally, the Contractor may be required to demonstrate acceptable laydown techniques off the project limits prior to proceeding on the project.

If the Contractor fails to achieve satisfactory laydown results after three consecutive 2500 foot sections have been attempted, cease production of that mix type until such time as the cause of the unsatisfactory laydown results can be determined.

As an exception, the Engineer may grant approval to produce a different mix design of the same mix type if the cause is related to mix problem(s) rather than laydown procedures. If production of a new mix design is allowed, proceed under the limited production procedures detailed above.

After initially proceeding under limited production, the Contractor shall immediately notify the Engineer if any additional lot on the project requires corrective action. The Engineer will determine if limited production procedures are warranted for continued production.

If the Contractor does not operate by the limited production procedures as specified above, the 5 lots, which require corrective action, will be considered unacceptable and may be subject to removal and replacement. Mix placed under the limited production procedures for unsatisfactory laydown will be evaluated for acceptance in accordance with Article 105-3.

The pay adjustment schedule for the Cumulative Straightedge Index (CSI) test results per lot is as follows:

| <b>Pay Adjustment Schedule for Cumulative Straightedge Index (CSI)</b><br><b>(Obtained by adding SE Index of up to 25 consecutive 100 ft. sections)</b> |                        |                      |   |                            |
|---|------------------------|----------------------|---|----------------------------|
| *CSI  | ACCEPTANCE<br>CATEGORY | CORRECTIVE<br>ACTION | PAY ADJUSTMENT  |                            |
|   |                        |                      | Before Corrective<br>Action                             | After Corrective<br>Action |
| 0-0   | Acceptable             | None                 | \$300 incentive   | None                       |
| 1-0 or 2-0  | Acceptable             | None                 | \$100 incentive   | None                       |
| 3-0 or 4-0  | Acceptable             | None                 | No Adjustment   | No Adjustment              |
| 1-1, 2-1,<br>5-0 or 6-0   | Acceptable             | Allowed              | \$300 disincentive                                      | \$300 disincentive         |
| 3-1, 4-1,<br>5-1 or 6-1   | Acceptable             | Allowed              | \$600 disincentive                                      | \$600 disincentive         |
| Any other<br>Number   | Unacceptable           | Required             | Per CSI after Correction(s)<br>(not to exceed 100% Pay) |                            |

**\*Either Before or After Corrective Actions**

Correct any deviation that exceeds a 0.4 inch blanking band such that the deviation is reduced to 0.3 inches or less.

Corrective actions shall be performed at the Contractor's expense and shall be presented for evaluation and approval by the Engineer prior to proceeding. Any corrective action performed shall not reduce the integrity or durability of the pavement that is to remain in place. Corrective action for deviation repair may consist of overlaying, removing and replacing, indirect heating and rerolling. Scraping of the pavement with any blade type device will not be allowed as a corrective action. Provide overlays of the same type mix, full roadway width, and to the length and depth established by the Engineer. Tapering of the longitudinal edges of the overlay will not be allowed.

Corrective actions will not be allowed for lots having a CSI of 40 or better. If the CSI indicates *Allowed* corrective action, the Contractor may elect to take necessary measures to reduce the CSI in lieu of accepting the disincentive. Take corrective actions as specified if the CSI indicates *Required* corrective action. The CSI after corrective action should meet or exceed *Acceptable* requirements.

Where corrective action is allowed or required, the test section(s) requiring corrective action will be retested, unless the Engineer directs the retesting of the of the entire lot. No disincentive will apply after corrective action if the CSI is 40 or better. If the retested lot after corrective action has a CSI indicating a disincentive, the appropriate disincentive will be applied.

Test sections and/or lots that are initially tested by the Contractor that indicate excessive deviations such that either a disincentive or corrective action is necessary, may be re-rolled with asphalt rollers while the mix is still warm and in a workable condition, to possibly correct the

problem. In this instance, reevaluation of the test section(s) shall be completed within 24 hours of pavement placement and these test results will serve as the initial test results.

Incentive pay adjustments will be based only on the initially measured CSI, as determined by the Engineer, prior to any corrective work. Where corrective actions have been taken, payment will be based on the CSI determined after correction, not to exceed 100 percent payment.

Areas excluded from testing by the N.C. Hearne Straightedge will be tested by using a non-mobile 10-foot straightedge. Assure that the variation of the surface from the testing edge of the straightedge between any two contact points with the surface is not more than 1/8 inch. Correct deviations exceeding the allowable tolerance in accordance with the corrective actions specified above, unless the Engineer permits other corrective actions.

Furnish the North Carolina Hearne Straightedge(s) necessary to perform this work. Maintain responsibility for all costs relating to the procurement, handling, and maintenance of these devices. The Department has entered into a license agreement with a manufacturer to fabricate, sell, and distribute the N.C. Hearne Straightedge. The Department's Pavement Construction Section may be contacted for the name of the current manufacturer and the approximate price of the straightedge.

No direct payment will be made for the work covered by this section. Payment at the contract unit prices for the various items covered by those sections of the specifications directly applicable to the work constructed will be full compensation for all work covered by this section including, but not limited to, performing testing in accordance with this specification, any corrective work required as a result of this testing and any additional traffic control as may be necessary.